Data Sheet
of 802.11g
WM-G-MR -01 B2B Wireless LAN Module

Change Sheet

Rev.	Date	Description of change			Approval & Date
		Page	Par	Change(s)	
1.0	09/14/04	All	All	Draft version for Review	
1.1	11/12/04			Update the pin assignment Update the mechanical drawing	
2.0	12/25/04			Update the picture & outpower of 802.11g	
2.1	04/11/05	6,15,21		1. Updated Executive summary for available date from "the middle of 1Q 2005" to "the end of 2Q 2005". 2.Update the mechanical drawing (more specific one) ; update pin description for xxx_B is from " Active low" to Active high"	
2.2	04/28/05	21,22		1. Update Pin"A10" pin definition from "left open no use" to " using as address line for CIS and memory access "and Type change from "No connection " to " Input PD 5VT"	
2.3	04/28/05	14		1. Update Power consumption and sensitivity	
2.4	11/8/05	21,22, 23, 24		Add SDIO Pin Definition	
2.5	11/28	8, 15, 18, 23		1. Operation Voltage 2. Temperature 3. Radio Specification 4. Radio Pre-test 5. Drawing of Pin definition	
2.6	01/06/06	9,15	4.3.2 4.5	1.IOH ; IOL value is corrected to typical not Min 2.Remove VOH on Min. 3.Tx output power add 12,24,36Mbps on the power range 14 +/-1dBm ; 12+/-1 dBm is for 48;54Mbps	
2.7	01/19/06	15	4.5	Update 802.11b output power tolerance from +1.5/-1.0 dBm to +2.0/-1.0 dBm	

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1. SUMMARY

The WM-G-MR-01 module - is one of the product families in USI's product offering, targeting for system integration requiring a smaller form factor. It also provides the standard migration to high data rate to USI's current SIP customers. The WM-G-MR-01 module providing B to B type connector is provided as option for customers, who want to have Board to board type assembly.

This document outlines the product requirements for a "system in Package" 802.11g/(b) module – here after referred as WM-G-MR-01 Module.

- The WM-G-MR-01 module is restricted to mobile and fixed operation at 20cm from the body..

2. DELIVERABLES

The following products and software will be part of the product.

- WM-G-MR-01 Module with packaging
- Evaluation kits

- Software utility which supporting customer for integration, performance test, and homologation. Capable of testing, loading (firmware) and configuring (MAC, CIS) for the WM-G-MR-01 module.
- Unit Test / Qualification report
- Product Specifications.
- Agency certification pre-test report base on adapter boards

3. REFERENCE DOCUMENTS

C.I.S.P.R. Pub. 22	"Limits and methods of measurement of radio interference characteristics of information technology equipment." International Special Committee on Radio Interference (C.I.S.P.R.), Third Edition, 1997.
CB Bulletin No. 96A	"Adherence to IEC Standards: "Requirements for IEC 950, 2nd Edition and Amendments 1 (1991), 2(1993), 3 (1995) and 4(1996). Product Categories: Meas, Med, Off, Tron." IEC System for Conformity Testing to Standards for Safety of Electrical Equipment (IECEE), April 2000.
CFR 47, Part 15-B	"Unintentional Radiators". Title 47 of the Code of Federal Regulations, Part 15, FCC Rules, Radio Frequency Devices, Subpart B.
CFR 47, Part 15-C	"Intentional Radiators". Title 47 of the Code of Federal Regulations, Part 15, FCC Rules, Subpart C. URL: http://www.access.gpo.gov/nara/cfr/waisidx_98/47cfr15_98.html
CSA C22.2 No. 950-95	"Safety of Information Technology Equipment including Electrical Business Equipment, Third Edition." Canadian Standards Association, 1995, including revised pages through July 1997.
EN 60 950	"Safety of Information Technology Equipment Including Electrical Business Equipment." European Committee for Electrotechnical Standardization (CENELEC), 1996, (IEC 950, Second Edition, including Amendment 1, 2, 3 and 4).
IEC 950	"Safety of Information Technology Equipment Including Electrical Business Equipment." European Committee for Electrotechnical Standardization, Intentional Electrotechnical Commission. 1991, Second Edition, including Amendments 1, 2, 3, and 4.
IEEE 802.11	"Wireless LAN Medium Access Control (MAC) And Physical Layer (PHY) Specifications." Institute of Electrical and Electronics Engineers. 1999.

4. TECHNICAL SPECIFICATION

The WM-G-MR-01 is a B2B type assembly part, technical supporting.

4.1. ABSOLUTE MAXIMUM RATING

Supply Power	Max +3.6 Volt	
Non Operating Temperature	- 40° to 85° Celsius	
Voltage ripple	+/- 2% 10KHz~100KHz	Max. Values not exceeding Operating voltage

4.2. RECOMMENDABLE OPERATION CONDITION

4.2.1. TEMPERATURE, HUMIDITY

WM-G-MR-01 module supports the operational requirements as listed in the table below.

Operating Temperature	-5° to 60° Celsius	
Humidity range	Max 95%	Non condensing, relative humidity

4.2.2 SUPPLY VOLTAGE

Power supply for the WM-G-MR-01 module will be provided by the host via the power pins

Voltage : VDD

Operating Voltage	3.0~3.5 Volt

4.2.3 SUPPLY CURRENT

802.11b/g

Current **(3.3V, 25 degree C)**

Condition	Minimum	Typical	Maximum
Transmit (54Mbps, 12 dBm)	-	480 mA	520 mA
Transmit (6Mbps, 14 dBm)	-	500 mA	540 mA
Transmit (11Mbps, 14 dBm)	-	485 mA	530 mA
Receive (54Mbps, -70 dBm)	-	275 mA	300 mA
Receive (11Mbps, -70 dBm)	-	255 mA	280 mA
Sleep connected average*	-	8 mA	15 mA
Deep Sleep**	-	1.2 mA	2.0 mA

Maximum Current **(Full temperature and voltage range)**

Condition	Maximum
Transmit (54Mbps, 12 dBm)	570 mA
Transmit (6Mbps, 14 dBm)	590 mA
Transmit (11Mbps, 14 dBm)	580 mA
Receive (54Mbps, -70 dBm)	320 mA
Receive (11Mbps, -70 dBm)	300 mA

* The sleep-connected current is measured under Marvell Linux V4 driver, with 100ms beacon interval and skipping 2 beacons.

** The Deep Sleep current is measured under Marvell Linux V4 driver.

4.3. COMPACTFLASH SPECIFICATION

4.3.1. DC ELECTRICALS

The DC specification is under 3.3 voltage. Over full range of values specified in the "Recommended Operation Condition" unless specified.

Power supply : VDD=3.3V

Symbol	Parameter	Condition	Min	Typ	Max	Units
V_{IH}	Input high voltage		0.5 VDD	-	VDD+0.5	V
V_{IL}	Input low voltage		-0.5	-	0.35VDD	V
V_{OH}	Output high voltage		2.4	-	-	V
V_{OL}	Output low voltage		-	-	0.4	V

4.3.2. AC ELECTRICALS

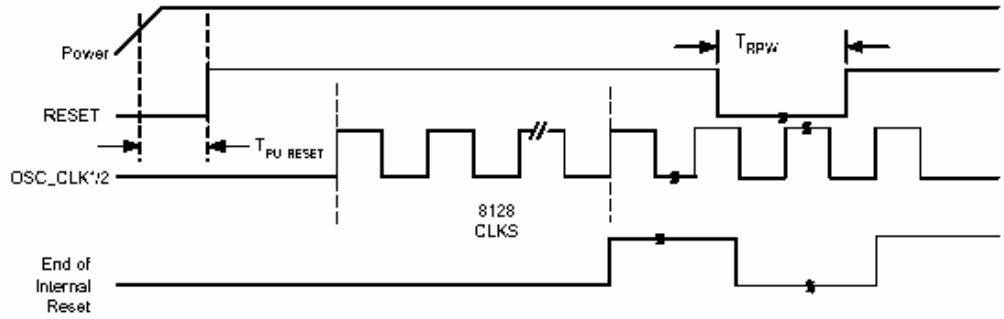
The DC specification is under 3.3 voltage. Over full range of values specified in the "Recommended Operation Condition" unless specified.

Power supply : VDD = 3.3V

Symbol	Parameter	Condition	Min	Typ	Max	Units
I_{OH}	Input high voltage	=0.7 VDD		11.3	32	mA
I_{OL}	Input low voltage	=0.18VDD		10.5	38	mA
V_{OH}	Output high voltage	0.2VDD- 0.6VDD		0.518	4.0	V/ns
V_{OL}	Output low voltage	0.6VDD-0.2VDD	-	0.592	4.0	V/ns

4.3.3. COMPACTFLASH PROTOCAL TIMING

4.3.3.1. RESET SPECIFICATION



RESETn is not needed for proper operation due to internal power-on reset logic.

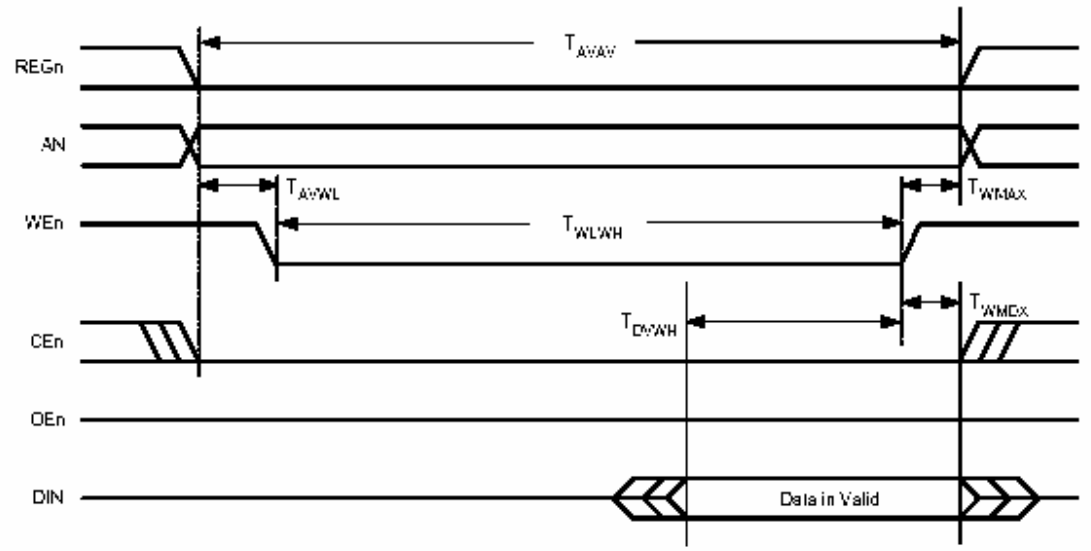
Input Reset Timing Requirement

Over full range of values specified in the Recommended Operating Conditions unless otherwise specified.

Symbol	Parameter	Condition	Min	Typ	Max	Units
T_{RPW}	RESETnpulse width			100 ns	--	

4.3.3.2. ATTRIBUTE MEMORY READ/WRITE TIMING SPECIFICATION

CompactFlash Configuration Register Write Timing Diagram

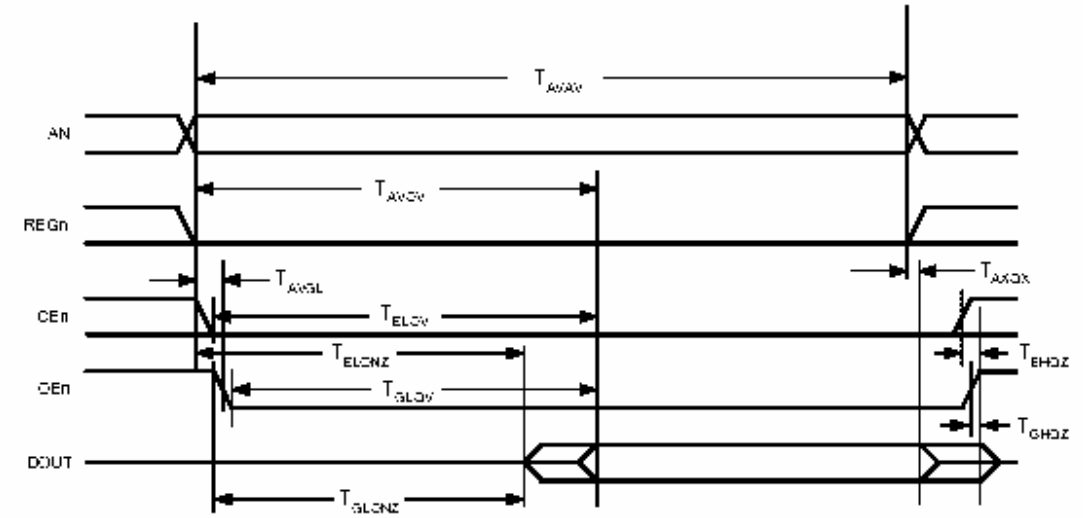


CompactFlash Write Timing Data

Over full range of values specified in the Recommended Operating Conditions unless otherwise specified.

Symbol	Parameter	Condition	Min	Typ	Max	Units
T_{AVAV}	Write Cycle Time		250	–	–	ns
T_{WLWH}	Write Pulse Width		150	--	–	ns
T_{AVWL}	Address Setup Time		30	–	–	ns
T_{WMAX}	Write Recovery Time		30	--	–	ns
T_{DVWH}	Data Setup Time for WE		80	--	–	ns
T_{WMDX}	Data Hold Time		30	–	–	ns

CompactFlash Configuration Register Read Timing Diagram



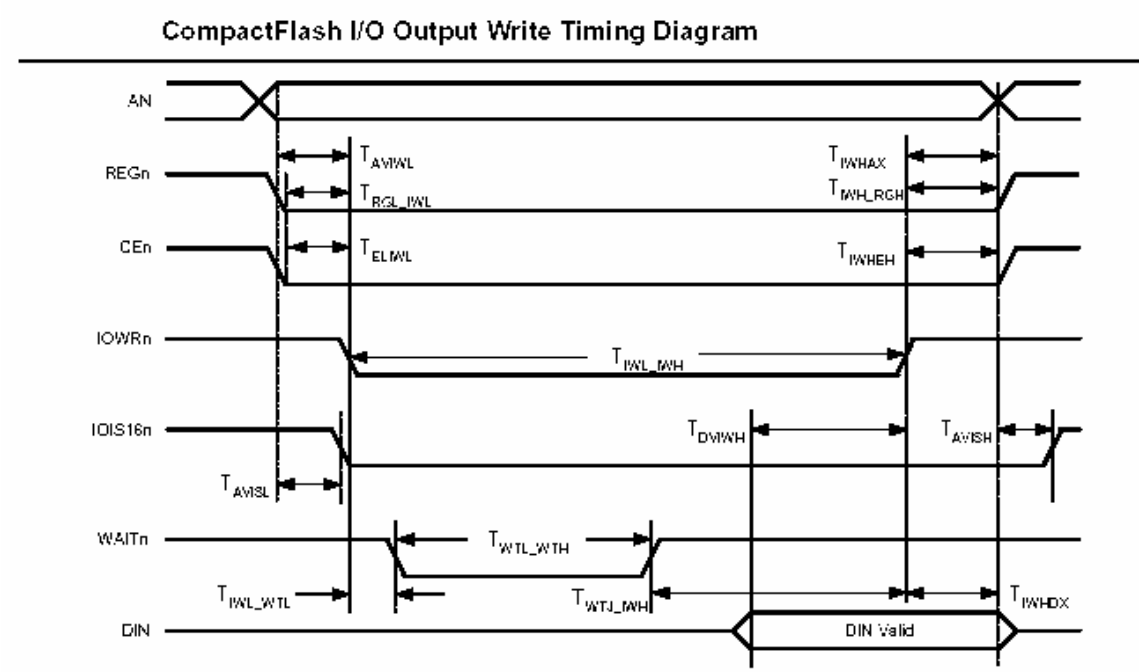
CompactFlash Read Timing Data

Over full range of values specified in the Recommended Operating Conditions unless otherwise specified.

Symbol	Parameter	Condition	Min	Typ	Max	Units
T_{AVAV}	Read Cycle Time		300	–	--	ns
T_{AVQV}	Address Access Time		--	–	300	ns
T_{ELQV}	Card Enable Access Time		--	–	300	ns
T_{GLQV}	Output Enable Access Time		--	–	150	ns
T_{EHQZ}	Output Disable Time from CE		--	–	100	ns
T_{GHQZ}	Output Disable Time from OE		--	–	100	ns
T_{AVGL}	Address Setup Time		30	–	--	ns
T_{ELQNZ}	Output Enable Time from CE		5	–	--	ns
T_{GLQNZ}	Output Enable Time from OE		5	–	--	ns
T_{AXQX}	Data Valid from Address Change		0	–	--	ns

4.3.3.3. I/O READ/WRITE TIMING SPECIFICATION

CompactFlash I/O Output Write Timing Diagram

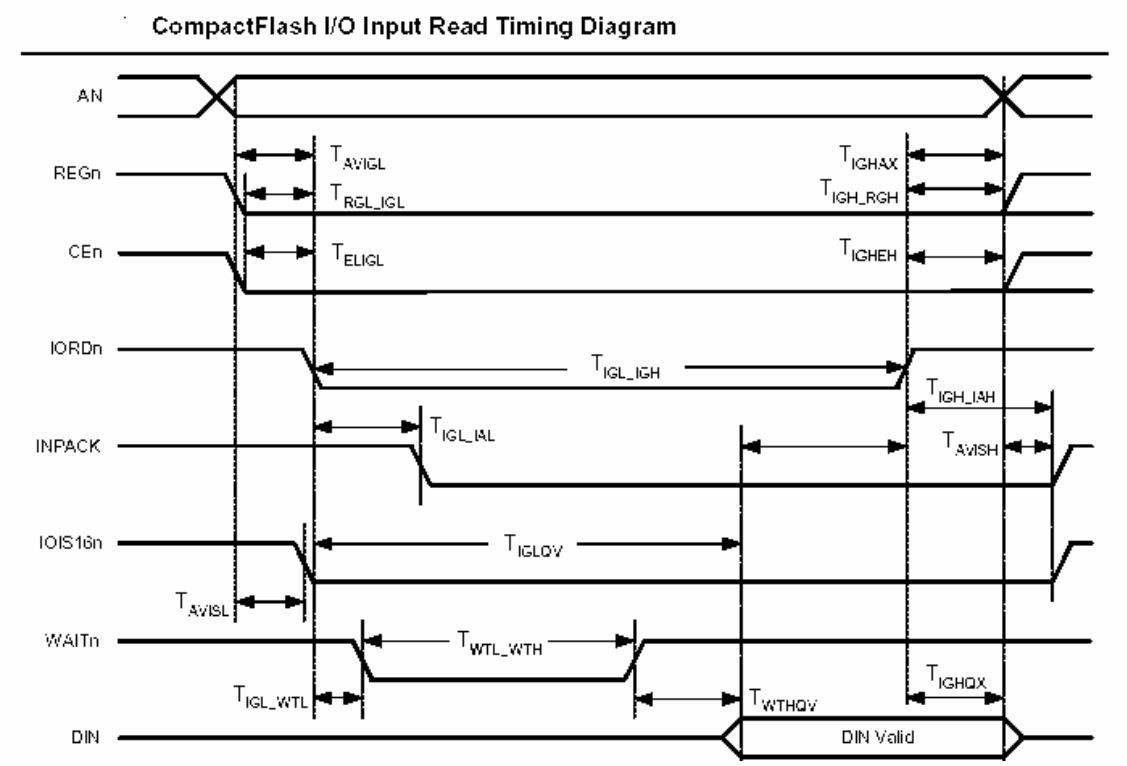


CompactFlash I/O Output Write Timing Data

Over full range of values specified in the Recommended Operating Conditions unless otherwise specified.

Symbol	Parameter	Condition	Min	Typ	Max	Units
T_{DVIWH}	Data Setup Time Before IOWR		60	--	--	ns
T_{IWHDX}	Data Hold Following IOWR		30	--	--	ns
T_{IWL_IWH}	IOWR Width Time		165	--	--	ns
T_{AVIWL}	Address Setup Before IOWR		70	--	--	ns
T_{IWHAX}	Address Hold Following IOWR		20	--	--	ns
T_{ELIWL}	CE Setup Before IOWR		5	--	--	ns
T_{IWHEH}	CE Hold Following IOWR		20	--	--	ns
T_{RGL_IWL}	REG Setup Before IOWR		5	--	--	ns
T_{IWH_RGH}	REG Hold Following IOWR		0	--	--	ns
T_{AVISL}	IOIS16 Delay Falling From Address		--	--	35	ns
T_{AVISH}	IOIS16 Delay Rising From Address		--	--	35	ns
T_{IWL_WTL}	Wait Delay Falling from IOWR		--	--	35	ns
T_{WTJ_IWH}	IOWR High from Wait High		0	--	--	ns
T_{WTL_WTH}	Wait Width Time		--	--	350	ns

CompactFlash I/O Input Read Timing Diagram



CompactFlash I/O Input Read Timing Data

Over full range of values specified in the Recommended Operating Conditions unless otherwise specified.

Symbol	Parameter	Condition	Min	Typ	Max	Units
T_{IGLQV}	Data Delay After IORD		--	--	100	ns
T_{IGHQX}	Data Hold Following IORD		0	--	--	ns
$T_{IGL\ IGH}$	IORD Width Time		165	--	--	ns
T_{AVIGL}	Address Setup Before IORD		70	--	--	ns
T_{IGHAX}	Address Hold Following IORD		20	--	--	ns
T_{ELIGL}	CE Setup Before IORD		5	--	--	ns
T_{IGHEH}	CE Hold Following IORD		20	--	--	ns
$T_{RGL\ IGL}$	REG Setup Before IORD		5	--	--	ns
$T_{IGH\ RGH}$	REG Hold Following IORD		0	--	--	ns
$T_{IGL\ IAL}$	INPACK Delay Falling from IORD		0	--	45	ns
$T_{IGH\ IAH}$	INPACK Delay Rising from IORD		--	--	45	ns

4.4. WIRELESS SPECIFICATIONS

The WM-G-MR-01 module complies with the following features and standards;

Features	Description
WLAN Standards	IEEE 802 Part 11g/b
Antenna	No Antenna diversity supported
Data Rates	1,2,5.5, 11, 6,9, 12,18, 24,36,48,54 Mbps
Medium Access Protocol	CSMA/CA (Collision Avoidance) with ACK
Network Access	Ad-hoc, Infrastructure

4.5. RADIO SPECIFICATIONS 802.11G

Over full range of values specified in the "Recommended Operation Condition" unless specified otherwise.

Features	Description
Frequency Band	2.4000 – 2.4835 GHz (2.4 GHz ISM Band)
Number of selectable Sub channels	11 channels
Modulation	OFDM, DSSS (Direct Sequence Spread Spectrum), DBPSK, DQPSK, CCK , 16QAM, 64QAM
Supported rates	1, 2, 5.5, 11, 6, 9, 12, 18, 24, 36, 48, 54 Mbps
Maximum receive level	- 10dBm (with PER < 8%)
Output Power	14 dBm +2.0/-1.0 dBm for 1, 2, 5.5, 11Mbps 14 dBm +/- 1.0 dBm for 6, 9, 12, 18, 24, 36Mbps 12 dBm +/- 1.0 dBm for 48, 54Mbps

4.6. RECEIVER SPECIFICATIONS

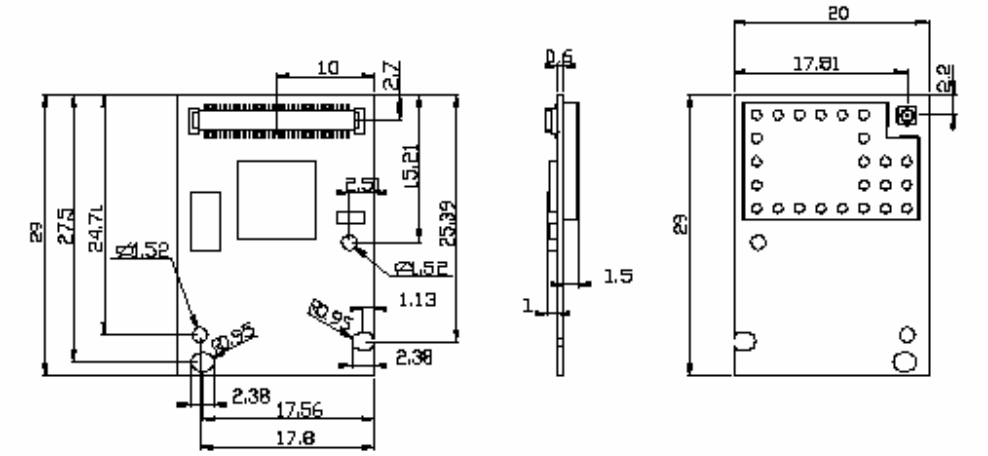
Receiver Characteristics (3.3V, 25 degree C)	Typical	Max.	Unit
PER <8%, Rx Sensitivity @ 11 Mbps	**-87**	**-85**	**dBm**
PER <8%, Rx Sensitivity @ 5.5 Mbps	**-89**	**-87**	**dBm**
PER <8%, Rx Sensitivity @ 2 Mbps	**-90**	**-88**	**dBm**
PER <8%, Rx Sensitivity @ 1 Mbps	**-92**	**-90**	**dBm**
PER <10%, Rx Sensitivity @ 54 Mbps	**-72**	**-70**	**dBm**

4.7. DIMENSIONS, WEIGHT AND MOUNTING

The following paragraphs provide the information for the size, weight and mounting of the WM-G-MR-01 module.

4.7.1. DIMENSIONS

The size and thickness of the WM-G-MR-01 module is listed below:



4.7.2. WEIGHT

Weight less than 3 gram including the shielding.

4.7.3. MOUNTING

The WM-G-MR-01 module is B2B mounted type component. The B2B connector and additional screw hole provide mounting mechanism to secure the WM-G-MR-01 module against vibration and shock on the host system.

4.8. SHOCK AND VIBRATION

All shock and vibration test is performed by using an interface adapter card. Additional shock and vibration tests can be performed – on request – by using the real host being PDA, Textbook or any other application.

Vibration

Operating	Frequency sweep from 3-150-3 Hz with a constant 0.25 G input
Non-Operational	Frequency sweep from 3-150-3 Hz with a constant 0.5 G input

Shock

Operational	25 G peak within 3.75 msec in normal base position
Non-Operational	65 G peak in 3.75 msec in normal base position. 30 G within 8 msec square or trapezoidal shock in + and - direction along the 3 axis. (Total 6 shocks)

Note: Above tests are executed without packaging material.

5. COMPATIBILITY AND INTEROPERABILITY

5.1. WI-FI LOGO

There is no module level WiFi applied for WM-G-MR-01 module.
Wi-Fi certification is dependent on the OS capability and application of the host system. The certification will be base on customer's request.

5.2. WHQL COMPLIANCE

Not required for WM-G-MR-01 module

6. CONFIGURABILITY

No user configuration needed. The CIS and MAC Address will be loaded during production of the WM-G-MR-01 module.

7. SECURITY

The WM-G-MR-01 module supports WEP64/128, WPA , AES-CCM which including TKIP (full version TKIP SSN /WPA) . Refer to Marvell Libertas solution.

8. OPERATING SYSTEM COMPATIBILITY

Drivers are supported for the following OS:

- Windows CE 3.0 /.NET , WinCE 4.2, Win CE 5.0
- Linux.
- Pocket PC 2003, 2004, 2005

9. LEGAL, REGULATORY & OTHER TECHNICAL CONSTRAINTS

The WM-G-MR-01 module is pre-tested to ensure that all requirements met as set forth in the following sections.

Final certification (module certification) requires the antenna of targeted system with a lead-time of 6 weeks. The product deliverable shall be a pre-tested WM-G-MR-01 module. No module level certification on WM-G-MR-01 module.

9.1. EMC

The module will be pre-tested to ensure that we can certify the product in the following countries when final certification will be performed on products and or platforms.

- US. FCC CFR47 Part 15-B, Class B
- Canada. CSA C22.2, Class B
- Europe. 89/336/EEC, EMC Directive, including CE Mark
- ETS300 826, EMC standard for 2.4GHz wideband transmission systems
- EN55022, Class B (Emissions)
  EN50082-1 (Immunity)
  EN61000-3-2 (Harmonic AC current emissions)
- Japan. VCCI Standard, Class 2 (Emissions)
- Korea (MIC)

9.2. COMPONENT SPECIFICATION

All components used in this device meet the following component approval requirements.

PRINTED WIRING BOARDS: The printed wiring boards shall be Underwriters Laboratories Inc. "Recognized Component" (ZPMV2) under the category for Printed Wiring Boards, and shall be flammability rated 94V-1 or less flammable. The board material shall be rated 130°C minimum.

CONNECTORS: Any connectors, if used, shall be Underwriters Laboratories, Inc. "Recognized" (ECBT2/RTRT2) in accordance with the requirements in the UL Standard for Safety, UL 498. Any polymeric connector housing shall be molded of plastics rated UL 94V-2 or less flammable when tested to UL 94.

WIRING: Any wiring material, if used, shall be UL Recognized Component Appliance Wiring Material (AVLV2). Wire shall be minimum rated 30V, 105°C.

PLASTIC PARTS - Any plastic parts used shall be molded of plastics that are UL "Recognized" (QFMZ2) and rated UL 94V-2 or less flammable when tested to UL 94.

"PB FREE" - The entire component Suppliers has to support Green requirement base on USI's policy. All of the components which including process and materials has to be Lead Free and RoHS Compliance.

9.3. RADIO PRETEST

The WM-G-MR-01 module is tested with adapter card to comply with following standard.
The testing is to assure the performance of regulatory requirement on module. Final certification will be conducted on system level:

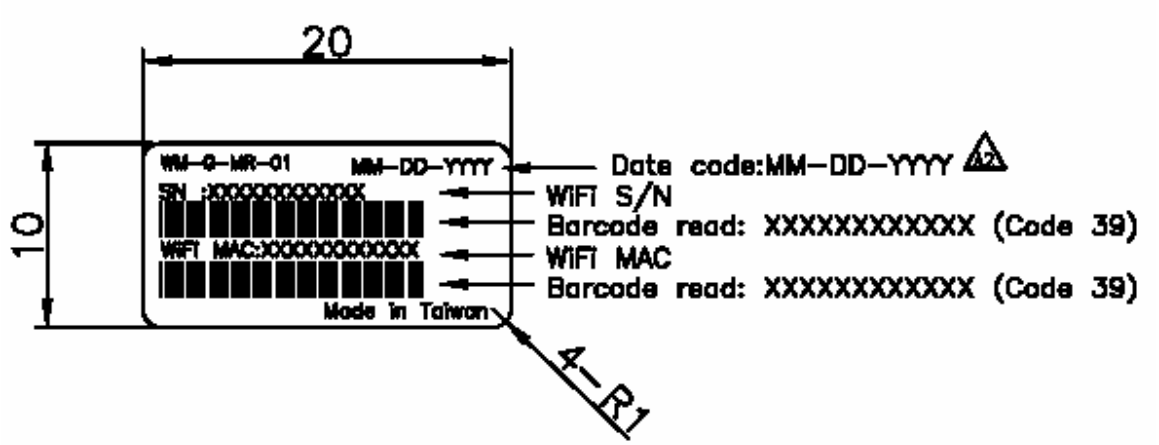
- US/CAN: FCC CFR47 Part 15.247
- Japan: TELEC
- Europe: CE EN 300 328

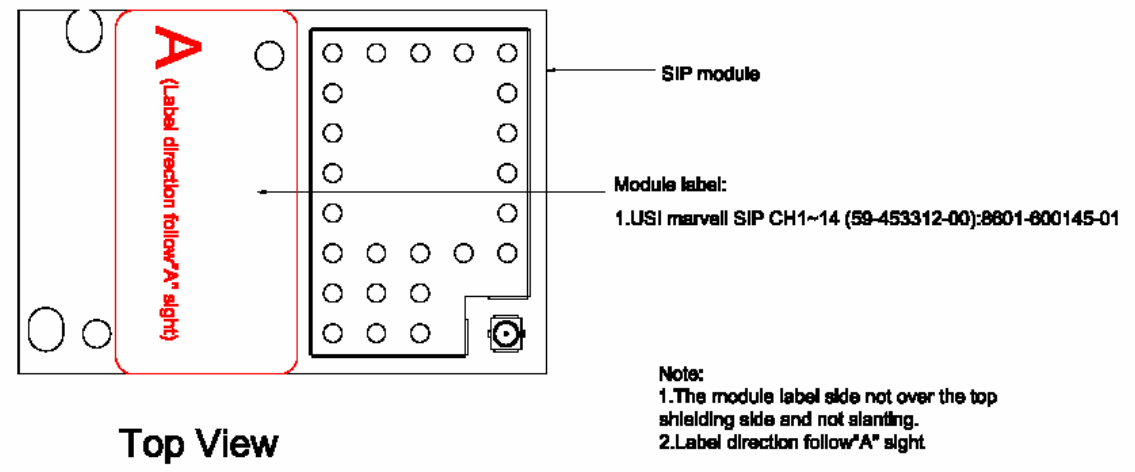
9.4. PRODUCT MARKING

The Module is marked which containing the following information:

Description:	WM-G-XX-XX
Serial number:	yyllwkxxxx
Revision:	format to follow USI revision level in PDM System

For the serial number the following format will be followed:
yy = last two digits of current year
ll = Assembly Location:
UT = USI Taiwan
UM = USI Mexico
UC = USI China
wk = current week (week period = starting on Monday)
xxxx = consecutive number, starting at 0000 at beginning of each week.





9.5. ENVIRONMENTALLY SAFE MATERIAL RESTRICTIONS

The use of polychlorinated biphenyls (PCB's) is prohibited (specifically) as dielectric in capacitors or transformers.
Electrolytic capacitors shall not be composed of any quaternary salt ammonium and/or gamma-butyrolactone ***(i.e. no el caps allowed).***
No CFC's (chlorofluorocarbons) shall be used anywhere in the manufacture of this product.
The use of tantalum capacitors should be minimized in any product of the product family [including the power-supply]. Where the use of tantalum caps cannot be avoided, provisions must be made in the manufacturing process to prevent reverse polarization.

The WM-G-MR-01 module hardware design should take the safety of operation into consideration and prevent the potential risk on Labor safety for manufacturing process.

9.6. FCC Warning Statements

THIS DEVICE COMPLIES WITH PART 15 OF THE FCC RULES. OPERATION IS SUBJECT TO THE FOLLOWING TWO CONDITIONS: (1) THIS DEVICE MAY NOT CAUSE HARMFUL INTERFERENCE, AND (2) THIS DEVICE MUST ACCEPT ANY INTERFERENCE RECEIVED, INCLUDING INTERFERENCE THAT MAY CAUSE UNDESIRED OPERATION.

NOTE: THE MANUFACTURER IS NOT RESPONSIBLE FOR ANY RADIO OR TV INTERFERENCE CAUSED BY UNAUTHORIZED MODIFICATIONS TO THIS EQUIPMENT. SUCH MODIFICATIONS COULD VOID THE USER¡¯S AUTHORITY TO OPERATE THE EQUIPMENT.